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DESCRIPTION

OF A

METHOD

OF TAKING THE

DIFFERENCES

OF

Right Ascension and Declination.

WITH THE

RETICULE RHOMBOIDE

Of Dr. BRADLEY,

WITHOUT PLACING THE INSTRUMENT IN THE PLANE OF THE EQUATOR,

BY H. E.

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DESCRIPTION &c.

THE very ingenious ſyſtem of Wires, invented by Dr. BRADLEY, for taking differences of Right Aſcenſion and Declination, and called ſince *the Reticule Rhomboide*, has this inconvenience in common with all others, that it requires being placed in an equatorial poſition.

As this is ſcarcely poſſible without an equatorial motion in the ſtand of the teleſcope, and even then is not accompliſhed either with eaſe or expedition, a method of applying the Rhomboid, by which a conſiderable degree of accuracy may be obtained, without the leaſt regard to the poſition of the inſtrument, provided it be but ſteady, muſt be often extremely convenient, and may ſometimes be very uſeful, particularly

with reſpect to comets which are ſeen at times when the obſerver may not have accurate inſtruments at hand, or time to remove and replace thoſe which he has; whereas this method requires no preparation but pointing the teleſcope to the object intended to be obſerved.

It is ſcarce neceſſary to ſay, that the conſtruction of the Rhomboid is, by forming a triangle, whoſe baſe (vide fig. 1.) B C is equal to the perpendicular A D. Then by the properties of ſimilar triangles, the differences of every line drawn parallel to the baſe will be equal to the parts of the perpendicular intercepted between thoſe lines. Thus let 1. 1. and 2. 2. (fig. 1.) be the paths of two ſtars through the Rhomboid; the difference of α β and γ δ, the tranſits of the ſtars through the field of the Rhomboid, will be equal to ϵ ζ, their difference in declination. Their difference of R. A. is found by halving the obſerved lines of the tranſits, which of courſe gives their paſſage over the centre of the inſtrument, no other wires being uſed but A B, and A C.

In

In practice, the Rhomboid is completed by joining two of these triangles by the base, in order that the whole extent of the field of the telescope may be applied to difference of declination; (vide fig. 3.) but the theory of the instrument exists in either of the triangles.

In order to make observations with the instrument out of an equatorial position, it is necessary to have a third wire bissecting the Rhomboid, as in fig. 2, and the appulses of the bodies to be compared, must be observed to each of the three wires. A drawing must be prepared of the Rhomboid, of such a size, that a second of time may be equal to about a tenth of an inch, or about twice the size of fig. 2. Then with a scale of equal parts, cut on a chamfered edge, apply the observed times of the transits of each star to the figure, so that they may exactly correspond to the observations, and draw pencil lines, which, if the observations are well made, will be parallel. The distance between these lines will be equal to the difference of declination of the two stars, measured on the

same

ſame ſcale of equal parts; which muſt be reduced to degrees and minutes of a great circle, at the rate of a degree to four minutes, as uſual: And a line let fall from the point of tranſit of one ſtar, through the middle wire perpendicularly on the path of the other, will give the correction of the differences of R. A. obſerved by the middle wire; that correction being meaſured from the point where the above-mentioned perpendicular cuts the path of the ſtar, to that ſtar's tranſit over the middle wire; which correction will, when the Rhomboid declines weſtward, as in fig. 2, be additive when the northern ſtar precedes in R. A. and ſubtractive when the ſouthern one precedes; and the contrary when the Rhomboid declines eaſtward.

Thus in fig. 2, let 1. 1. and 2. 2. be the paths of two ſtars obſerved through the Rhomboid, and let the diſtance $\alpha\,\beta$ be twenty-one ſeconds in time; $\beta\,\gamma$ ten ſeconds; $\delta\,\varepsilon$ thirty-five ſeconds; and $\varepsilon\,\zeta$ be ſixteen ſeconds and a half; then if a ſcale of one-twentieth of an inch to a ſecond be uſed, they will appear

appear as in the drawing, and the difference of declination will be the perpendicular $o\ \epsilon$, or $\beta\ o$, equal to twelve seconds in time, or 3′ of a degree; and the correction to be applied as above directed, to the differences of R. A. found by the transits of the stars over the central wire A D, will be the space $o\ \beta$, or $\epsilon\ o$, equal to $8\frac{1}{2}$ seconds in time.

If one of the stars at 3. 3. passes over the lower half of the Rhomboid, the operation is exactly the same, as is evident by inspection of the figure where $\eta\ \theta$ is $29\frac{1}{2}$ seconds, $\theta\ \iota$ 26 seconds. The difference of declination between 2. 2. and 3. 3. is $\epsilon\ \phi = 17$ seconds, or 4′ 15″ of a degree, and $\theta\ \phi$ the correction for the R. A. $12\frac{1}{3}$ seconds.

I have hitherto, for the sake of simplicity, considered the stars to be observed as being in the equator; when they are not, previous to every other operation, the observed times must be reduced to equatorial, by multiplying them by the cosine of the declination; but this is necessary in the usual method of observing

observing with the Rhomboid. It is also to be observed, that the lines of the two stars' paths through the instrument, when laid down on the drawing, will seldom be exactly parallel, as a very little error in the observations will sensibly affect their parallelism; but if the inclination be small, it will cause but a very slight error in the measure of the declination, which I generally take in the centre of the instrument.

I beg to repeat again, that this method is only meant as an approximation, and does not pretend to a greater accuracy than two seconds of time in R. A. and 30″ of a degree in declination, in and near the equator. Yet this may often be of use.

F I N I S.

Fig: 1

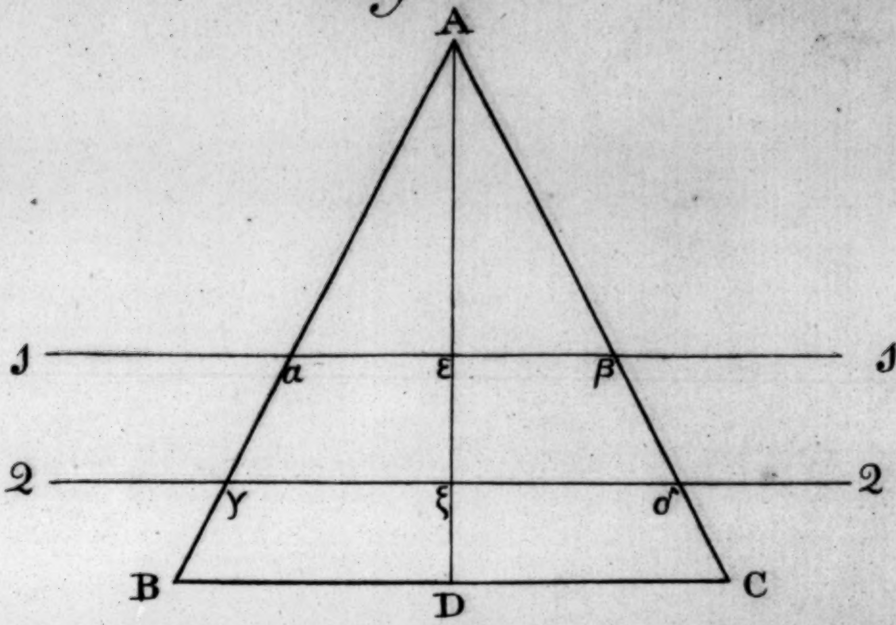

Fig: 2

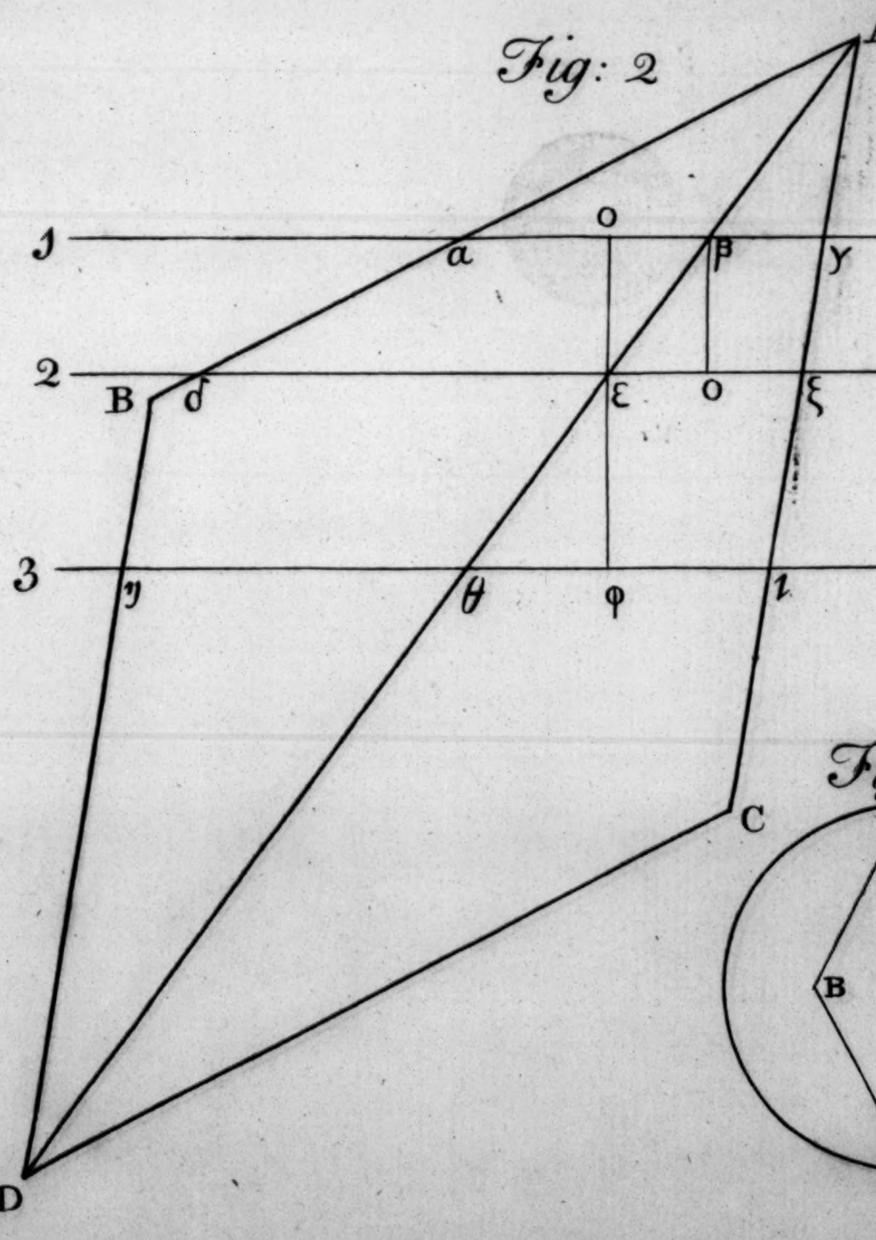

Fig: 3

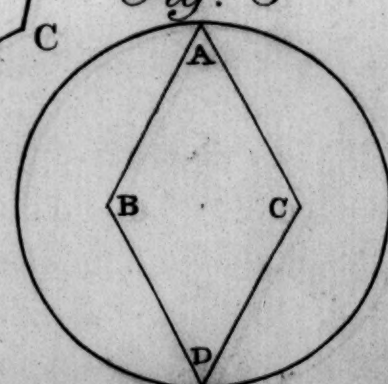

Fig 1

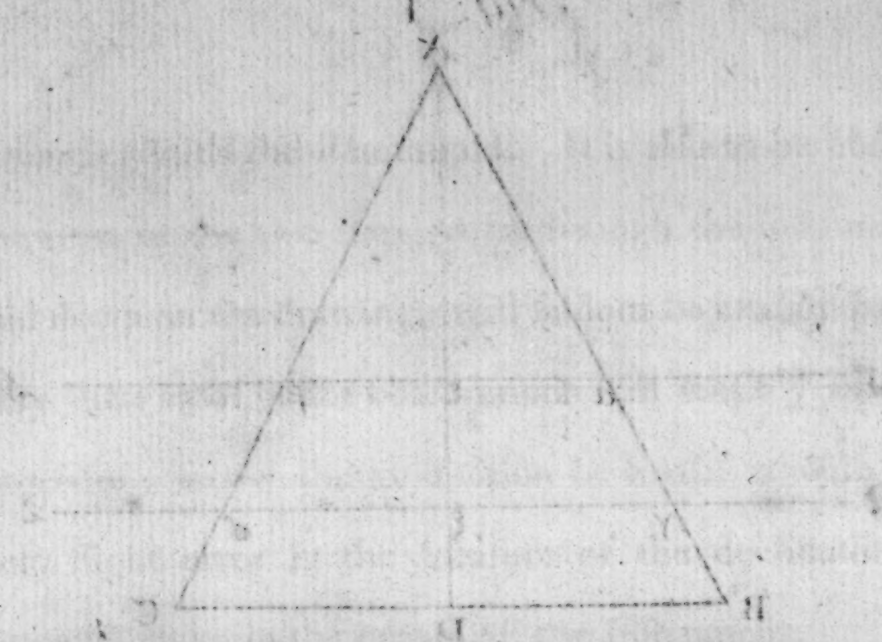

Fig 2

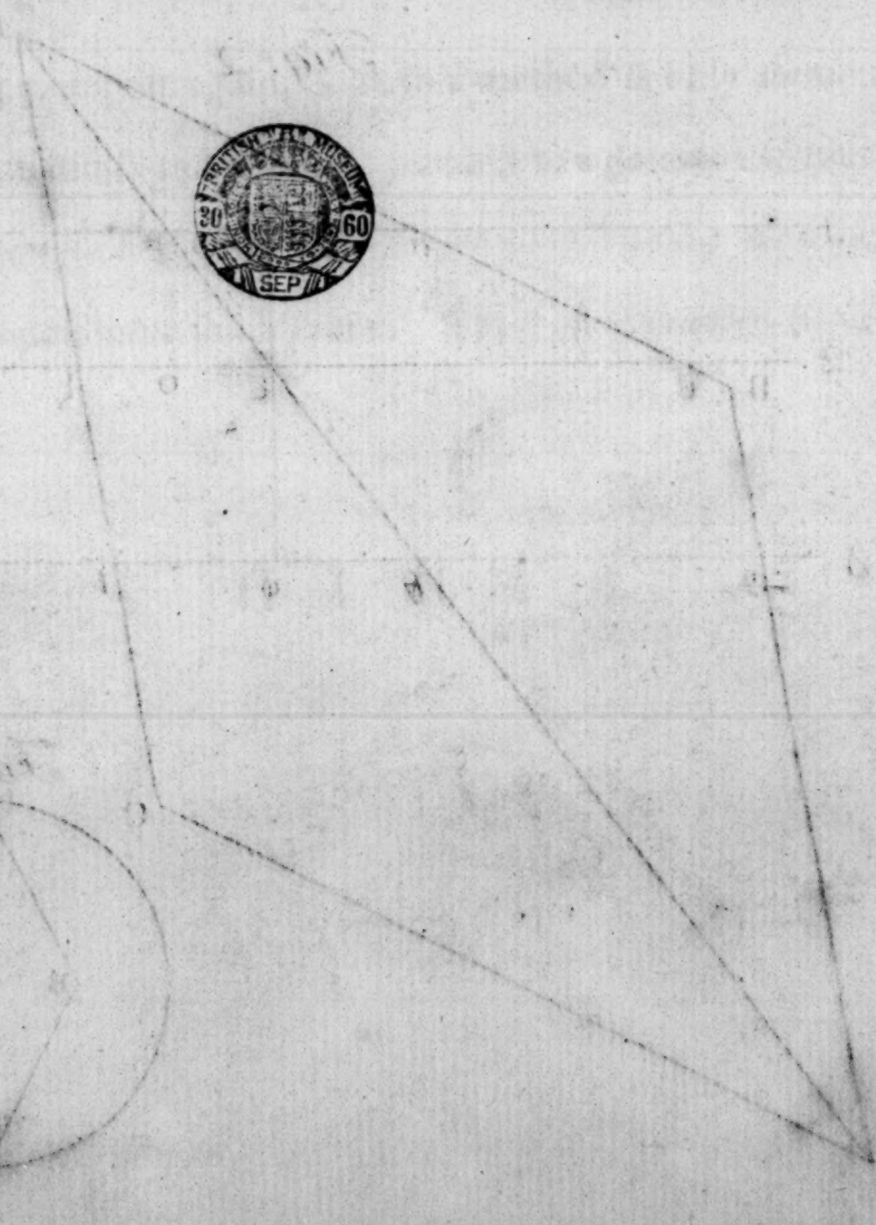

Fig 3